CountCOFI Remora Manual

Shelby Bloom, Michaela Alksne, Bruce Thayre, Josh Jones, John Hildebrand, Simone Baumann-Pickering

The CountCOFI Remora was built into *Triton* to modularize the post-survey CalCOFI data processing workflow into four simple steps, allowing users to easily generate data tables, sighting and effort summary and tables, and maps of visual sightings and visual effort.

This manual details the steps required to generate tables and figures using the CountCOFI Remora for visual survey data collected onboard CalCOFI surveys using the CountCOFI software. A detailed user manual for the CountCOFI data collection software can be found here:

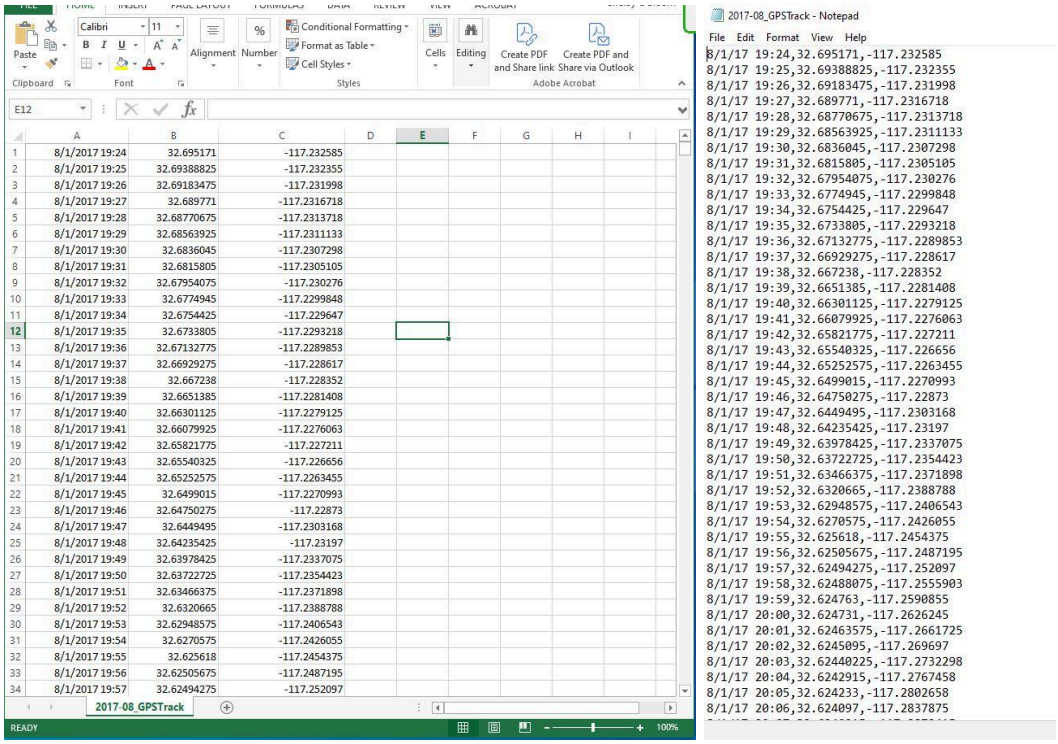
"\\frosty.ucsd.edu\GOOGLE_DRIVE_BU\MBARC_ALL\CalCOFI\code\fromBJT\countCOFI\manual"

CountCOFI Remora Software requirements:

- RStudio
- Matlab (<2016b)
- *Triton*
- GMT/MATLAB Toolbox (built with GMT version 6.3.0, could probably be used on versions thereafter but be wary)
    - https://www.generic-mapping-tools.org/ - main page, can find and download GMT
    - https://github.com/GenericMappingTools/gmtmex?tab=readme-ov-file - gmtmex GitHub for those that need to download this (only applies to macOS people)
    - https://docs.generic-mapping-tools.org/5.4/matlab_wrapper.html - installation explicit instructions, note for Windows you only need to download the GMT package from the website and not gmtmex from Github
    - https://agupubs.onlinelibrary.wiley.com/doi/10.1002/2016GC006723 - paper that used tool, good to reference for understanding what the parameters are within a gmt function
- M_map package (download here: https://www.eoas.ubc.ca/~rich/map.html) and a GSHHS high-resolution coastline database (<version 2.3.7 (Remora built with 2.3.7)) download here: https://www.ngdc.noaa.gov/mgg/shorelines/data/gshhs/)
    - It is nice to unzip/uncompress the GSHHS data into `m_map/data`, otherwise, you have to edit the FILNAME setting in m_gshhs.m to point to the appropriate files
    - Refer to this (https://www.eoas.ubc.ca/~rich/mapug.html#p1) for getting started with m_map (i.e., how to download) and this (https://www.eoas.ubc.ca/~rich/mapug.html#p8.6) regarding GSHHS data in m_map

CountCOFI Remora Data Requirements:

- CountCOFI daily raw .txt files from a given CalCOFI survey.
- Ships underway data, ie the GPS coordinates of ship trackline. This can be obtained from the CalCOFI Chief Scientist and may be uploaded to the CalCOFI website, accessible here. Needs to be formatted as a csv with datetime in column 1, latitude in column 2, and longitude in column 3 (see picture below).



	A	B	C
1	8/1/2017 19:24	32.695171	-117.232585
2	8/1/2017 19:25	32.69388825	-117.232355
3	8/1/2017 19:26	32.69183475	-117.231998
4	8/1/2017 19:27	32.689771	-117.2316718
5	8/1/2017 19:28	32.68770675	-117.2313718
6	8/1/2017 19:29	32.68563925	-117.2311133
7	8/1/2017 19:30	32.6836045	-117.2307298
8	8/1/2017 19:31	32.6815805	-117.2305105
9	8/1/2017 19:32	32.67954075	-117.230276
10	8/1/2017 19:33	32.6774945	-117.2299848
11	8/1/2017 19:34	32.6754425	-117.229647
12	8/1/2017 19:35	32.6733805	-117.2293218
13	8/1/2017 19:36	32.67132775	-117.2289853
14	8/1/2017 19:37	32.66929275	-117.228617
15	8/1/2017 19:38	32.667238	-117.228352
16	8/1/2017 19:39	32.6651385	-117.2281408
17	8/1/2017 19:40	32.66301125	-117.2279125
18	8/1/2017 19:41	32.66079925	-117.2276063
19	8/1/2017 19:42	32.65821775	-117.227211
20	8/1/2017 19:43	32.65540325	-117.226656
21	8/1/2017 19:44	32.65252575	-117.2263455
22	8/1/2017 19:45	32.6499015	-117.2270993
23	8/1/2017 19:46	32.64750275	-117.22873
24	8/1/2017 19:47	32.6449495	-117.2303168
25	8/1/2017 19:48	32.64235425	-117.23197
26	8/1/2017 19:49	32.63978425	-117.2337075
27	8/1/2017 19:50	32.63722725	-117.2354423
28	8/1/2017 19:51	32.63466375	-117.2371898
29	8/1/2017 19:52	32.6320665	-117.2388788
30	8/1/2017 19:53	32.62948575	-117.2406543
31	8/1/2017 19:54	32.6270575	-117.2426055
32	8/1/2017 19:55	32.625618	-117.2454375
33	8/1/2017 19:56	32.62505675	-117.2487195
34	8/1/2017 19:57	32.62494275	-117.252097

2017-08_GPSTrack - Notepad

File Edit Format View Help

```
8/1/17 19:24,32.695171,-117.232585
8/1/17 19:25,32.69388825,-117.232355
8/1/17 19:26,32.69183475,-117.231998
8/1/17 19:27,32.689771,-117.2316718
8/1/17 19:28,32.68770675,-117.2313718
8/1/17 19:29,32.68563925,-117.2311133
8/1/17 19:30,32.6836045,-117.2307298
8/1/17 19:31,32.6815805,-117.2305105
8/1/17 19:32,32.67954075,-117.230276
8/1/17 19:33,32.6774945,-117.2299848
8/1/17 19:34,32.6754425,-117.229647
8/1/17 19:35,32.6733805,-117.2293218
8/1/17 19:36,32.67132775,-117.2289853
8/1/17 19:37,32.66929275,-117.228617
8/1/17 19:38,32.667238,-117.228352
8/1/17 19:39,32.6651385,-117.2281408
8/1/17 19:40,32.66301125,-117.2279125
8/1/17 19:41,32.66079925,-117.2276063
8/1/17 19:42,32.65821775,-117.227211
8/1/17 19:43,32.65540325,-117.226656
8/1/17 19:44,32.65252575,-117.2263455
8/1/17 19:45,32.6499015,-117.2270993
8/1/17 19:46,32.64750275,-117.22873
8/1/17 19:47,32.6449495,-117.2303168
8/1/17 19:48,32.64235425,-117.23197
8/1/17 19:49,32.63978425,-117.2337075
8/1/17 19:50,32.63722725,-117.2354423
8/1/17 19:51,32.63466375,-117.2371898
8/1/17 19:52,32.6320665,-117.2388788
8/1/17 19:53,32.62948575,-117.2406543
8/1/17 19:54,32.6270575,-117.2426055
8/1/17 19:55,32.625618,-117.2454375
8/1/17 19:56,32.62505675,-117.2487195
8/1/17 19:57,32.62494275,-117.252097
8/1/17 19:58,32.62488075,-117.2555903
8/1/17 19:59,32.624763,-117.2590855
8/1/17 20:00,32.624731,-117.2626245
8/1/17 20:01,32.62463575,-117.2661725
8/1/17 20:02,32.6245095,-117.269697
8/1/17 20:03,32.62440225,-117.2732298
8/1/17 20:04,32.6242915,-117.2767458
8/1/17 20:05,32.624233,-117.2802658
8/1/17 20:06,32.624097,-117.2837875
```

Step 1.

Before using the CountCOFI Remora, daily raw CountCOFI files must be converted to their “expanded” format using the R Script “cc-expand.R.” A version of this script can be found here:

“./Triton/Remoras/CountCOFI/cmpt/cc-expand.R”

Here is an example of raw data output:

```
ev,date,X,Y,spd,hdg,X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12,X13,X14,X15,X16,X17,X18,X19,X20,X21,X22,X23,X24,X25
NEW,2016-08-31 07:24:41,Longitude   ,Latitude  , SP.D,  HDG,
EFF,2016-08-31 07:24:41,Longitude   ,Latitude  , SP.D,  HDG,EF
EFF,2016-08-31 07:24:47,-120.9970000,33.9868333, 09.1,  154,0,0,AAA,BBB,001     ,Melville
POS,2016-08-31 07:24:51,-120.9968333,33.9866666, 09.2,  151,
POS,2016-08-31 07:25:01,-120.9966666,33.9861666, 09.3,  152,
SEA,2016-08-31 07:25:10,-120.9965000,33.9860000, 09.6,  155,G ,012,PC ,056,010,030,SL,WNW,0032,01,010
POS,2016-08-31 07:25:11,-120.9963333,33.9858333, 09.4,  156,
POS,2016-08-31 07:25:21,-120.9961666,33.9855000, 09.4,  155,
POS,2016-08-31 07:25:31,-120.9960000,33.9850000, 09.9,  155,
POS,2016-08-31 07:25:41,-120.9956666,33.9846666, 09.8,  155,
POS,2016-08-31 07:25:51,-120.9955000,33.9843333, 09.4,  153,
POS,2016-08-31 07:26:01,-120.9951666,33.9838333, 09.8,  154,
POS,2016-08-31 07:26:11,-120.9950000,33.9835000, 09.2,  153,
POS,2016-08-31 07:26:21,-120.9948333,33.9831666, 09.6,  151,
```

```
POS,2016-08-31 07:26:31,-120.9945000,33.9826666, 09.8,  155,
POS,2016-08-31 07:26:41,-120.9941666,33.9823333, 09.9,  154,
```

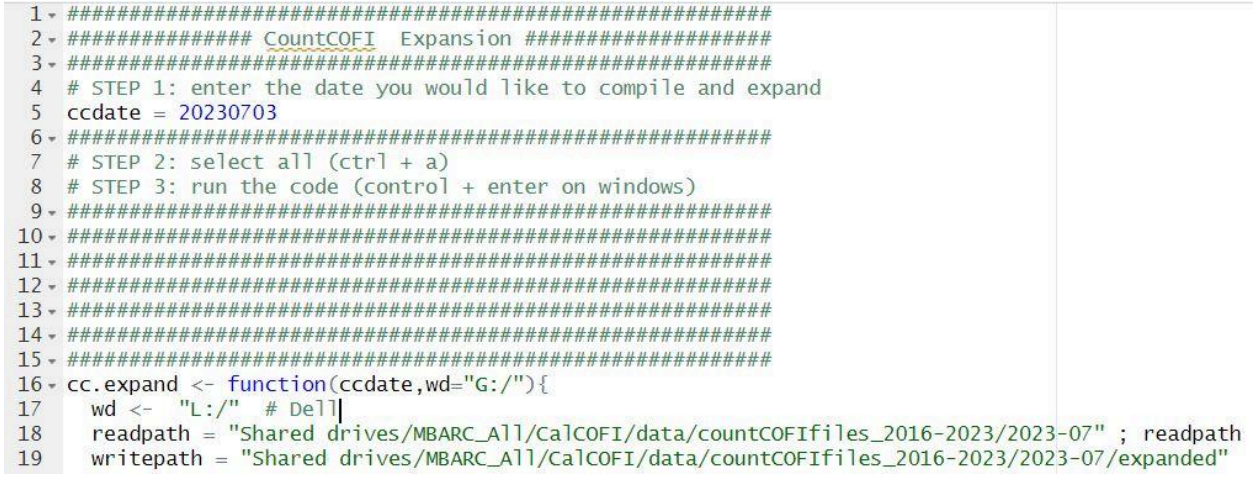
And here is an example of the raw data in the expanded format:

```
EID,X,Y,ev,when,spd,hdg,cruise,vessel,eff,trn,port,star,qual,vis,precip,cloud,glareL,glareR,glareS,wind.dir,wind.spd,bft,swell,X1
,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12,X13,X14,X15,X16,X17,X18,X19,X20,X21,X22,X23,X24,X25

3,-120.997,33.9868333,EFF,2016-08-31 07:24:47, 09.1,  154,1,Melville                          ,0,0,AAA,BBB,NA,NA,NA,   NA,   NA,
NA,NA,NA,NA,NA,NA,0,0,AAA,BBB,1,Melville            ,,,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

4,-120.9968333,33.9866666,POS,2016-08-31 07:24:51, 09.2,  151,1,Melville                  ,0,0,AAA,BBB,NA,NA,NA,      NA,      NA,
NA,NA,NA,NA,NA,NA,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

5,-120.9966666,33.9861666,POS,2016-08-31 07:25:01, 09.3,  152,1,Melville                  ,0,0,AAA,BBB,NA,NA,NA,      NA,      NA,
NA,NA,NA,NA,NA,NA,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

6,-120.9965,33.986,SEA,2016-08-31 07:25:10, 09.6,  155,1,Melville               ,0,0,AAA,BBB,G  ,12  ,PC  ,  56,  10,  30,SL,WNW,32
,1,10 ,G ,12,PC ,056,10,030,SL,WNW,32,1,10,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

7,-120.9963333,33.9858333,POS,2016-08-31 07:25:11, 09.4,  156,1,Melville                  ,0,0,AAA,BBB,G   ,12   ,PC   ,   56,   10,
30,SL,WNW,32  ,1,10 ,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

8,-120.9961666,33.9855,POS,2016-08-31 07:25:21, 09.4,  155,1,Melville           ,0,0,AAA,BBB,G  ,12  ,PC  ,  56,  10,  30,SL,WNW,32
,1,10 ,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

9,-120.996,33.985,POS,2016-08-31 07:25:31, 09.9,  155,1,Melville             ,0,0,AAA,BBB,G ,12 ,PC , 56, 10, 30,SL,WNW,32  ,1,10
,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

10,-120.9956666,33.9846666,POS,2016-08-31 07:25:41, 09.8,  155,1,Melville                  ,0,0,AAA,BBB,G   ,12   ,PC   ,   56,   10,
30,SL,WNW,32  ,1,10 ,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

11,-120.9955,33.9843333,POS,2016-08-31 07:25:51, 09.4,  153,1,Melville           ,0,0,AAA,BBB,G  ,12  ,PC  ,  56,  10,  30,SL,WNW,32
,1,10 ,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

12,-120.9951666,33.9838333,POS,2016-08-31 07:26:01, 09.8,  154,1,Melville                  ,0,0,AAA,BBB,G   ,12   ,PC   ,   56,   10,
30,SL,WNW,32  ,1,10 ,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA

13,-120.995,33.9835,POS,2016-08-31 07:26:11, 09.2,  153,1,Melville              ,0,0,AAA,BBB,G  ,12  ,PC  ,  56,  10,  30,SL,WNW,32
,1,10 ,,NA,,,NA,,,,NA,NA,NA,NA,NA,NA,NA,NA,,NA,NA,NA,NA,NA,NA,NA,NA
```

Expanded files simply add effort and conditions fields (observer positions, beaufort sea state, ect) to each line of data output. To run cc-expand.R, the user will need to modify three lines in the script:

ccdate: should be the yyyymmdd formatted day of the survey.
readpath: file path to raw CountCOFI txt files
writepath: file path to save newly expanded txt files

Screenshot of cc-expand.R for user reference:



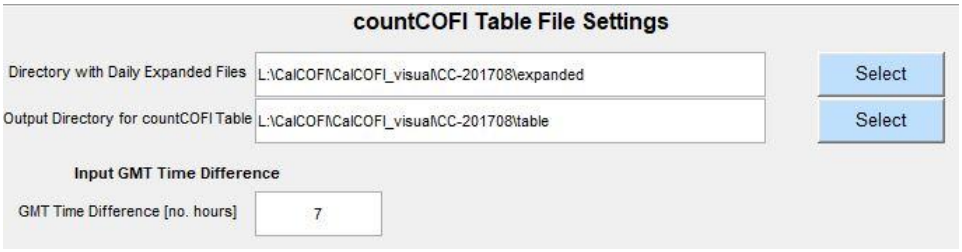
```
1  ##########################################################
2  ############### CountCOFI  Expansion ####################
3  ##########################################################
4   # STEP 1: enter the date you would like to compile and expand
5   ccdate = 20230703
6  ##########################################################
7   # STEP 2: select all (ctrl + a)
8   # STEP 3: run the code (control + enter on windows)
9  ##########################################################
10 ##########################################################
11 ##########################################################
12 ##########################################################
13 ##########################################################
14 ##########################################################
15 ##########################################################
16 cc.expand <- function(ccdate,wd="G:/"){
17   wd <-  "L:/"  # Dell
18   readpath = "Shared drives/MBARC_All/CalCOFI/data/countCOFIfiles_2016-2023/2023-07" ; readpath
19   writepath = "Shared drives/MBARC_All/CalCOFI/data/countCOFIfiles_2016-2023/2023-07/expanded"
```

Note, cc-expand.R must be run on raw txt files from every individual day of a given CalCOFI survey!

- If there are multiple txt files for one day, cc-expand will concatenate all of them by comparing filename strings from the ccdate variable.
- Ideally, cc-expand.R should be run at the end of every day onboard CalCOFI so the observer can quality control the data they collected. If this is not possible, cc-expand.R should be run at the end of every survey.
- Errors with cc-expand.R occur if the user adds unnecessary commas, usually in the comments section, when they are inputting additional information for a sighting, whether change, or shift change.

Step 2:

Once you have made daily expanded files for a given survey, you are ready to use the CountCOFI Remora. The first dropdown option from the CountCOFI Remora is *Make CountCOFI* table:



Input the path to the daily expanded files and the output directory for the table. The CountCOFI table is a concatenated version of the daily expanded files that is formatted to match CalCOFI visual survey tables before CountCOFI existed.

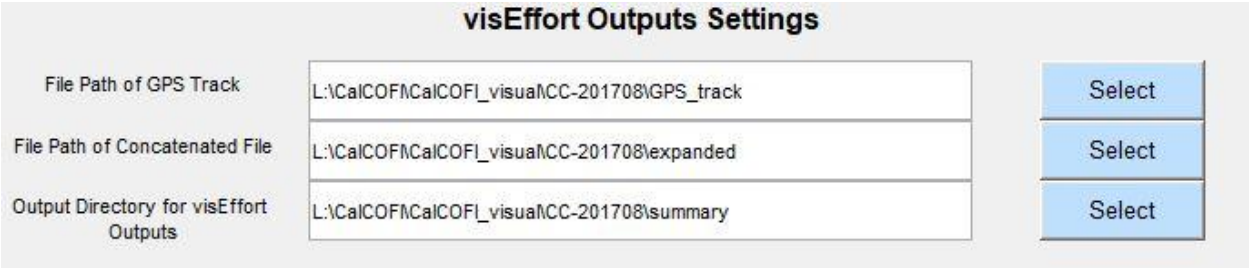
Step 3:

The second dropdown option is *Concatenate Daily Expanded Files*. This step will simply aggregate all of the daily expanded files into one per survey .txt:

Step 4:

The third dropdown option is *Make visEffort Outputs.* This step requires the ships underway GPS track formatted into a .csv file as such:

8/1/2017 19:24	32.69517	-117.233
8/1/2017 19:25	32.69389	-117.232
8/1/2017 19:26	32.69183	-117.232



The output of this step will include summary figures and tables for the survey:

a. visEffortSummary.csv: a summary table of number of mysticete and odontocete species sighted, number of hours on effort, and on effort trackline distance in km.
b. mystInfo.csv: a summary table of the number of groups and number of individuals of each mysticete species sighted while on effort.
c. odontInfo.csv: a summary table of the number of groups and number of individuals of each odontocete species sighting while on effort.
d. [Genus, species].txt files: for every species observed, a .txt file will be generated with the coordinates of every on-effort observation of that species. These are inputs to the next step.
e. Trackline effort: .png with visual survey effort. Blue is on effort, red is off effort.

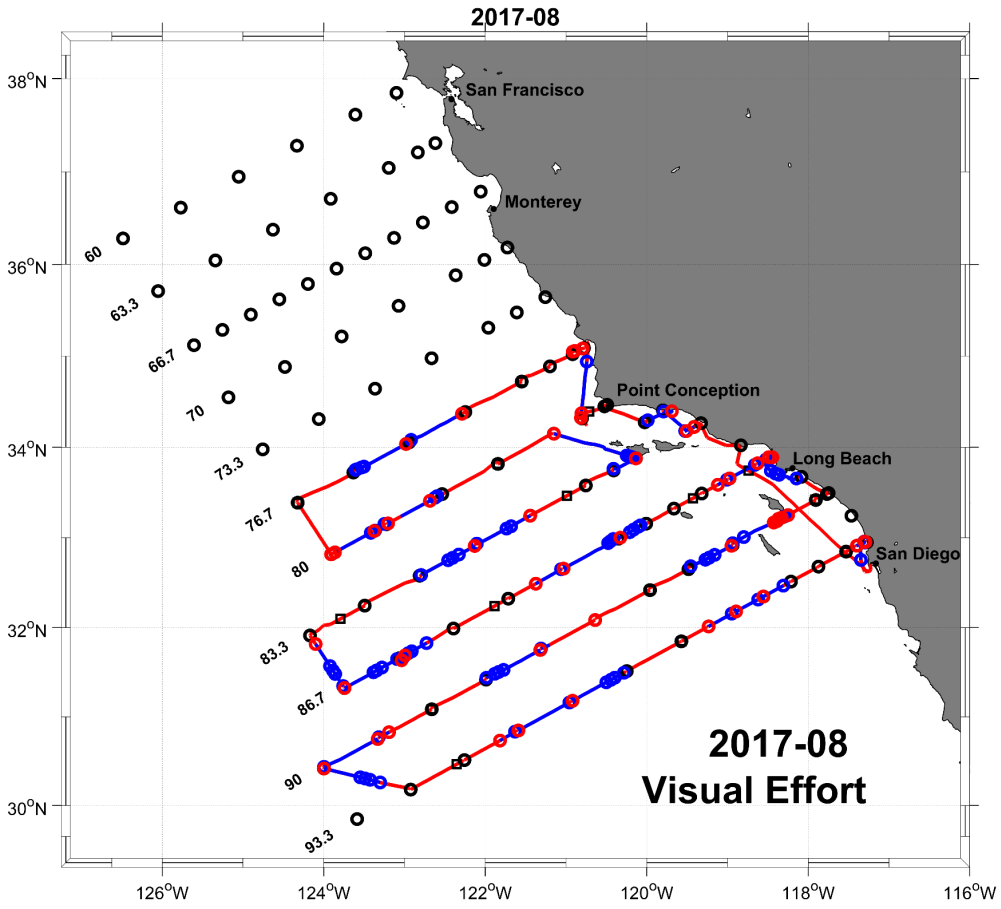
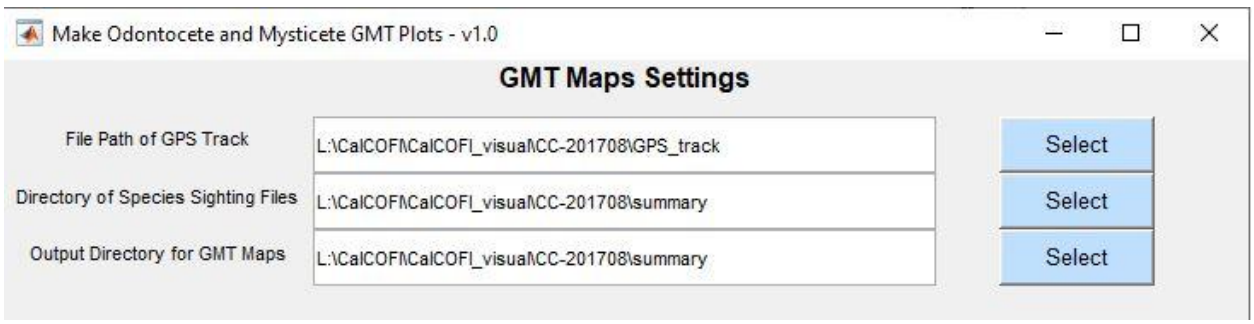


Figure 1. Example of 2017-08 visual survey effort.

Step 5.

Once species observation .txt files have been generated, they can be used as inputs to *Make Odontocete and Mysticete GMT maps:*



The outputs are as follows:

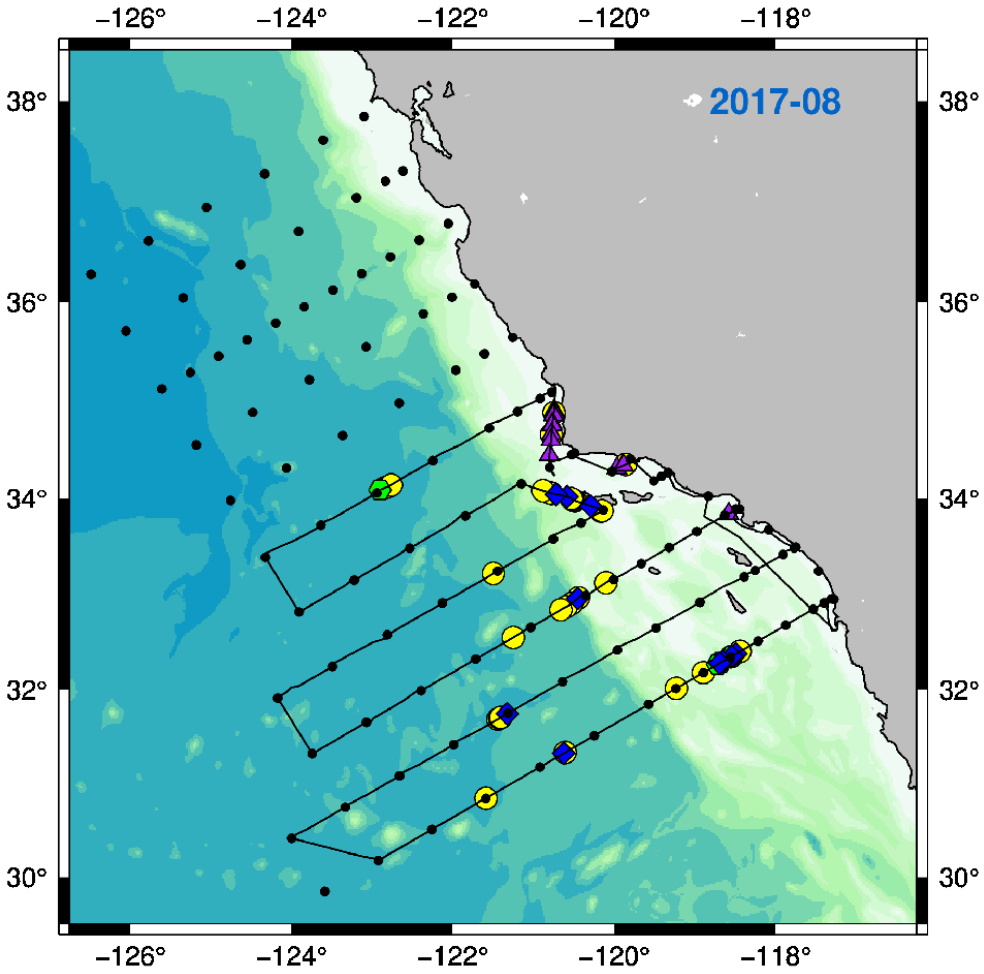


Figure 2. Mysticete sightings overlaid the CalCOFI trackline. Species legend found at: “./Triton/Remoras/countCOFI/CalofiSpeciesLegend.tiff”

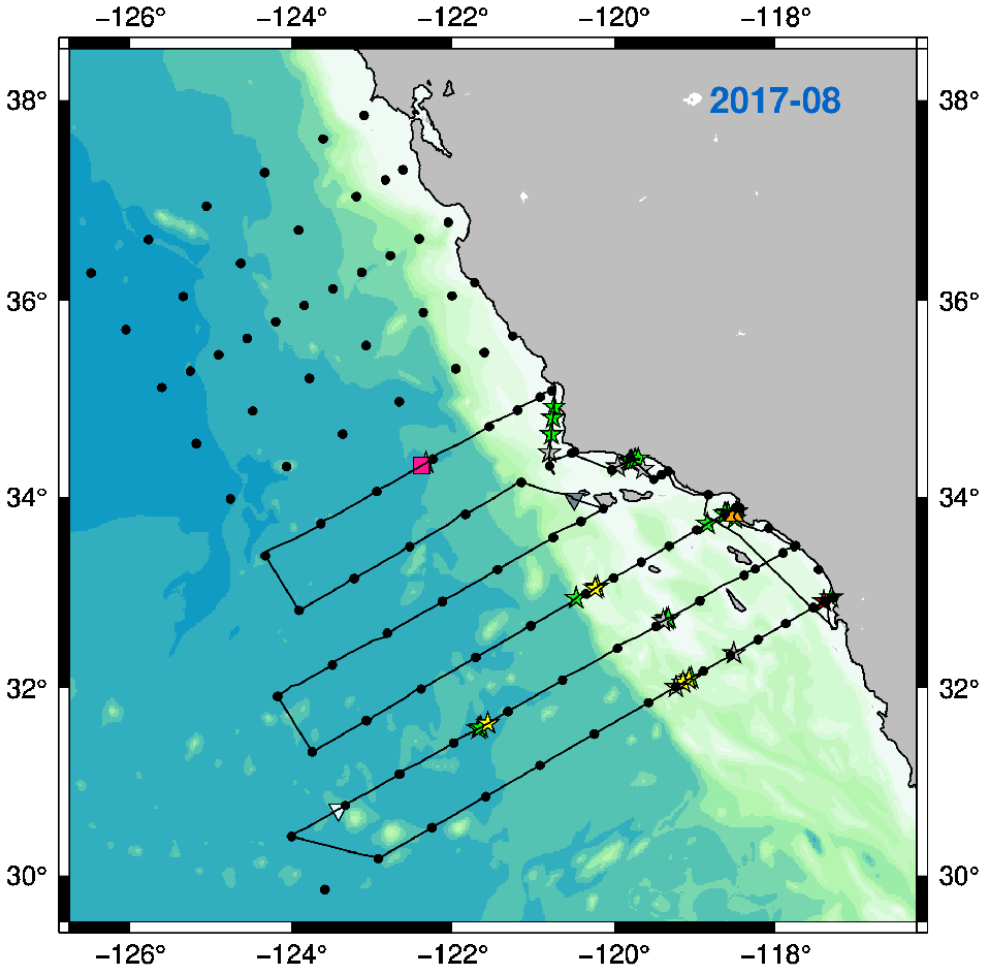
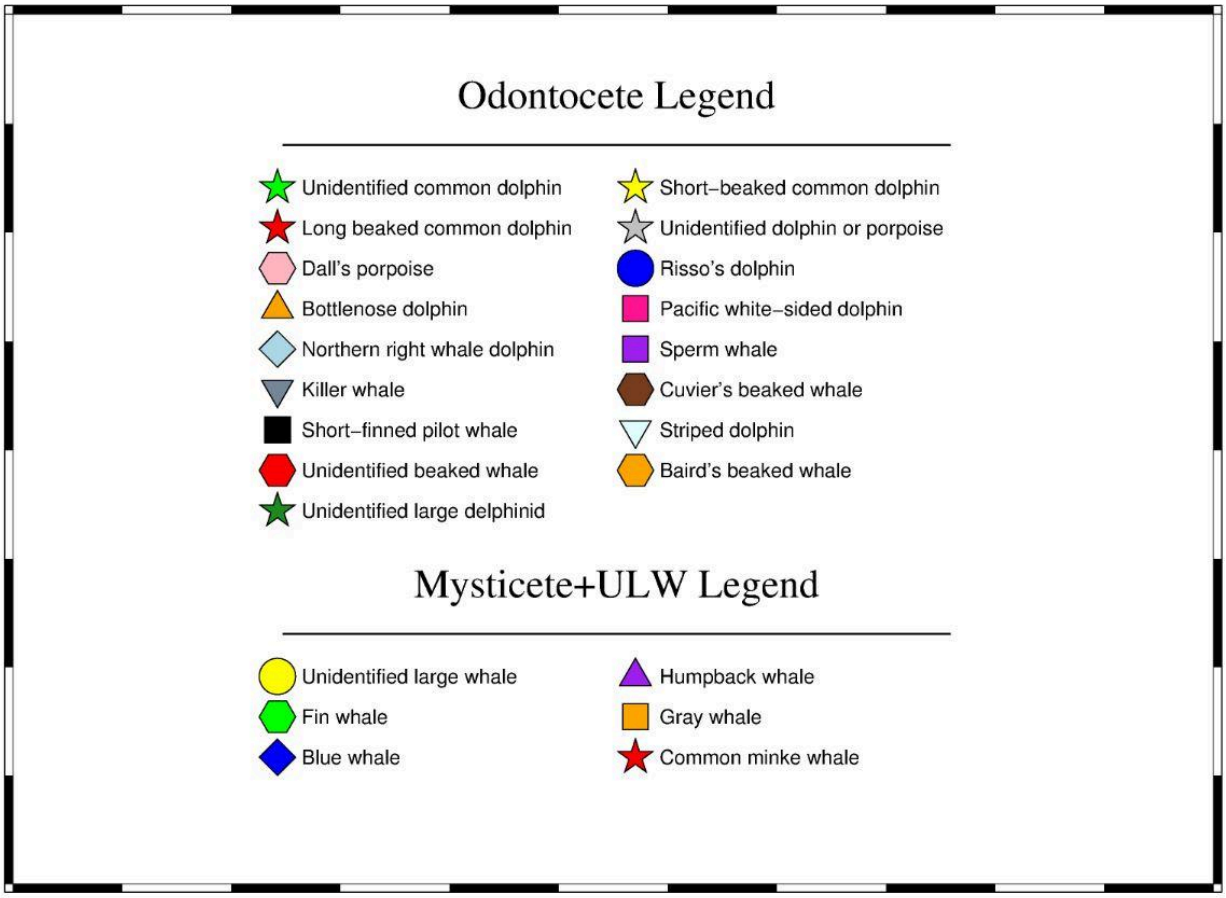


Figure 3. Odontocete sightings overlaid the CalCOFI trackline. Species legend found at: “./Triton/Remoras/countCOFI/CalofiSpeciesLegend.tiff”


Odontocete Legend
Unidentified common dolphin
Long beaked common dolphin
Dall's porpoise
Bottlenose dolphin
Northern right whale dolphin
Killer whale
Short-finned pilot whale
Unidentified beaked whale
Unidentified large delphinid
Short-beaked common dolphin
Unidentified dolphin or porpoise
Risso's dolphin
Pacific white-sided dolphin
Sperm whale
Cuvier's beaked whale
Striped dolphin
Baird's beaked whale
Mysticete+ULW Legend
Unidentified large whale
Fin whale
Blue whale
Humpback whale
Gray whale
Common minke whale